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August 28, 2002

MEMORANDUM

SUBJECT: Eastman Chemical Company Site Visit Report

FROM: Ivy Porpotage

TO: Ron Josephson, EPA

The completed Site Visit Report for the April 17, 2002 visit to Eastman Chemical Company, Tennessee Division is enclosed with attachments.

If you have any questions please call Ivy at (703) 934-3564.

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SITE VISIT REPORT

EPA Contract No. 68-W-02-006
Work Assignment No. 2

Facility:	Eastman Chemical Company Kingsport, Tennessee
Date:	Wednesday, April 17, 2002
Time:	8:00 am - 3:30 pm

BACKGROUND

In August 1999, the Chemical Manufacturers Association (CMA), now the American Chemistry Council (ACC), submitted a paper to the EPA describing regulatory options for revising the RCRA mixture and derived-from rules as part of the Hazardous Waste Identification Rule (HWIR). CMA was concerned that the mixture and derived-from rules resulted in the regulation of low risk wastes as hazardous wastes, and that the HWIR process was not providing regulatory relief in a timely manner. In November 1999, EPA published a proposal to promulgate the mixture and derived-from rules on a final basis and solicited comments on the five regulatory options suggested by CMA (64 Fed. Reg. 63382). In July 2000, ACC resubmitted these regulatory options and expressed concern that the final rule would not meet public expectations concerning the over breadth of the rule. The final rule (66 Fed. Reg. 27266), published in May 2001, retained the revisions proposed by EPA in 1999. EPA is now readdressing HWIR and reconsidering the alternatives proposed by ACC. As an ACC member and a regulated entity, Eastman Chemical Company invited EPA to visit its Tennessee Division facilities.

INTRODUCTION

Eastman Chemical's Tennessee operations were established in 1920 to produce methanol for Eastman Kodak. In 1994, Eastman Chemical Company became an independent company headquartered in Kingsport, Tennessee. The Kingsport site includes approximately 6,000 acres of land between the South Fork Holston River and the Big Sluice, though the main plant site occupies 858 acres. Eastman produces more than 1,000 chemicals, fibers, and plastics.

A wastewater treatment facility (WWTF), used to treat wastewaters from various manufacturing areas, processes 25 million gallons of wastewater daily. The wastewater treatment process is depicted in Figure 1. Wastewater is neutralized and then mixed with microorganisms that consume and digest the organic wastes. These microorganisms consume 99.5% of the organic material. The process produces treated water, which is returned to the South Fork Holston River, and a biosludge filter cake. This filter cake is subject to RCRA under the mixture and derived-from rules.

OBJECTIVES

The objectives of this visit were to give EPA a tour of Eastman's WWTF and to provide EPA with information regarding the impacts of the mixture and derived-from rules on a regulated entity.

PARTICIPANTS

Both representatives of EPA and representatives of the Tennessee Department of Environment and Conservation (TDEC) were invited to visit the Eastman facility. The following personnel participated in part or all of the day's activities.

EPA Representatives:	Laura Burrell
	Matt Hale, Deputy Director, Office of Solid Waste (OSW)
	Barnes Johnson, Director, Economics, Methods, and Risk Assessment Division, OSW
	Ron Josephson
	Frank McAlister, Chief, International and Special Projects Branch (ISPB)
	Zubair Saleem
	Steve Kroner
	Ivy Porpotage (ICF Consulting)
TDEC Representatives:	Bethanie Glynn
	Rick Whitson
Eastman Representatives:	John Barber
	Etta Clark
	Nancy Dotson
	Janet Evans
	Art Meyers
	Bethany Thompson
	Gerald Wrye
	David Sandidge

SUMMARY OF FACILITY TOUR

The facility tour began at approximately 8:30 am after a short introductory meeting. Participants boarded a small bus for a driving tour narrated by a retired Eastman employee. The first units observed during the tour were the 4 lift stations used to transfer wastewaters to the WWTF. Each lift station handles 5,000 gal/min for a total of approximately 28 million gal/day. Eastman pumps a total of 400 million gal/day of river water from the South Fork Holston River Dam (controlled by the Tennessee Valley Authority) to be used in cooling towers and for various processes. The next point of interest was the hazardous waste incinerator. The incinerator is used to burn solvents, lab wastes, commercial chemicals, acids, ketones, alcohols, toluene and methyl ethyl ketone, among other waste streams. The organic destruction efficiency for the incinerator is typically 99.9999%. A wet scrubber utilized by the incinerator transfers scrubber water to the WWTF at a rate of 500 gal/min.

Additional facility information provided during driving tour:

- Eastman recycles one million lbs/year of acetic acid.
- The powerhouse utilizes electrostatic precipitators to remove 99.9% fly ash from the air.
- Eastman is the largest manufacturer of polyethylene terephthalate (PET).
- The facility uses 58 carloads (5,800 tons) of coal per day.
- The railcars are used to transfer products to Savannah, Georgia for overseas shipment.
- Approximately 800 railcar switches per day are made on the tracks.
- Eastman is a large producer of polymers, fibers, and cigarette filters.
- The Holston Army Ammunition Plant adjacent to Eastman manufactures explosives for the Department of Defense.
- Approximately 1,200 waste streams are approved for discharge through the WWTF.
- The Environmental Management Information System (EMIS) is used to track every stream.
- Process upsets trigger the national discharge alert system and close the WWTF.
- Approximately 8,500 of 16,000 Eastman employees are located at Kingsport.
- The facility has an on-site fire department employing seven full-time fire fighters.
- A hydrogen plant on site produces all the hydrogen used in Eastman's processes.
- Both continuous and batch processes for chemical manufacture are operated at the Kingsport facility.
- A coal gasification plant for chemical manufacture was constructed on site in 1983.
- The benzene reported by Eastman to EPA is from refueling cars and trucks; benzene is not used in chemical processes.

The coal gasification process uses a wet-ground, high-sulfur coal and a high-oxygen catalyst. Spent coal is sent to a landfill. Syn gas from the system goes through a cleanup process and is used to make acetic anhydride and methanol.

Wastewater Treatment Facility

Following the driving tour of the site, Bethany Thompson conducted a walking tour of the WWTF. The building housing the influent pump (and process headworks) was observed. The system includes six influent pumps and five are typically used. Wastewaters enter the system at a rate of 18,000 gal/min through three main influent lines (36-, 30-, and 24-inch lines). Wastewaters entering the system are usually high in acetic acid content with a pH of 3.0 to 3.2. About 50 truckloads of lime are added daily in the neutralization tanks. Ms. Thompson explained that the grit chamber changes the flow of the wastewater. The grit (primary sludge, made up mostly of plastic pellets) settles out through the conical bottom of the chamber and is dropped onto the biosludge. This primary sludge is about 2/3 (two thirds) wastewater. Postneutralization wastewaters have high head lines of approximately 40 to 80 gal/min. The wastewaters flow from the grit chamber to two equalization tanks with a 2.4 million gallon capacity each. The diversion basins are used for very high loads or rainfall events. The basins are always open, but the annual flow is generally less than one percent.

Following equalization, four trains of the wastewaters flow through a splitter box with weir gates into the aeration basins. The wastewaters are step-fed into the three aeration basins (55%, 25%, 20%) for each of the four trains. Wastewaters are introduced into the basins at a depth of 20 to 22 ft. Eastman has five subsurface air blowers and uses coarse bubble aeration. Only three blowers are operated in the winter and four in the summer. The flow into the aeration basins is 17 to 18 gal/min and a temperature of 95º F is maintained. The hydraulic retention time is slightly more than one day. Samples are collected from the aeration basins to check the pH. Ammonia or phosphoric acid may be added to adjust the pH; however, the wastewaters do not have significant variation since Eastman operates mostly continuous processes. The biomass added depends on the load; however, in the first stage it ranges from 3,000 to 4,000 mg/L. The target sludge age is 11 to 12 days but may be longer during the winter.

Polymer is added to the wastewaters following aeration and rapid mix, just prior to the clarifiers. The addition of polymers before the clarifiers works better than before the rapid mix because of shearing. The four clarifiers are operated in parallel and pull the sludge from the center of the unit. About 90% of the sludge is returned to the aeration basins. Ms. Thompson pointed to seven (unlined) RCRA surface impoundments adjacent to the WWTF. These surface impoundments served as the original treatment process, but are now used for effluent holding. Eastman does not intend to close these surface impoundments in the near future. Groundwater monitoring samples collected in the vicinity are usually well below drinking water standards or are non-detect. Samples are collected annually for Appendix IX parameters and quarterly for metals analysis. A risk assessment conducted for the retrofit variance indicated no off-site movement of these groundwaters.

Ms. Thompson explained that the sludge exiting the clarifiers is eventually co-combusted with coal. Spray irrigation was examined at one point in time, but did not work well due to runoff and other problems. The sludge is sent for dewatering immediately following the clarification process. The hazardous waste boilers used for combustion of the sludge also have toluene and acetic acid as feeds. The combustion units are operated 24 hours/day by five operators. Ash from the boilers is Bevill-exempt and sent to an on-site Subtitle D landfill.

Janet Evans indicated that samples are collected at the combined interceptor, before the headworks, for gas chromatography (GC). The influent is tested for total organic carbon (TOC) and pH. Samples are collected from the equalization tanks for TOC, pH, phosphorus, and ammonia analyses. The GC sampling is conducted daily to establish the appropriate biomass load. Operators attempt to maintain a target level of dissolved oxygen. All sampling is reported under the Superfund Amendments and Reauthorization Act (SARA), though no reporting is required for the influent under any regulation.

Incinerator Residues

The chlorine feed to the incinerator is 50 to 60 lbs/hr during normal operations, though 500 lbs/hr were fed during the trial burn. Eastman attempts to keep the dioxin levels from the incinerator below the detection limit for the new Maximum Achievable Control Technology (MACT) standard. No current dioxin data are available. Dioxin reported in the 2001 Toxics Release Inventory is from a 1986 data point. Approximately 80% of the dioxin is believed to be disposed in the ash, which goes to a land disposal unit. A modified Universal Treatment Standard (UTS) analysis is conducted on the ash, as well as the 8270/8260A analyses for organics. Approximately 280 total constituents are analyzed in the ash and data are maintained in EMIS. Incinerator scrubber water makes up about three percent (500 gal/min) of the wastewater stream entering the WWTF and is the source of toluene in the influent.

WWTF Control Room

The tour group was subsequently led to the control room where Doug Cross explained the monitoring process for the WWTF. The monitoring process follows the waste stream from the lift stations through the WWTF. Pumps and level indicators are checked as well as pneumatic indicators. The lime in the neutralization tanks is measured. Small deviations cause an alarm which the operator investigates. The monitoring also ensures that the grinders are working, as well as the recycle valve. Each component of the WWTF is monitored in a similar manner.

Dewatering Building

Around 10:00 am the tour group was escorted into the dewatering building where belt filter presses are used to squeeze water from the sludge. Eastman intends to install a new filter press that will increase the solids ratio and decrease the amount of wastewaters requiring incineration. The current filter cake is approximately 15% solids. Wastewater from the clarifiers first enters the gravity drain and then flows through to the pressure zone into the belt filter presses. Grit from the grit chamber is dropped into the de-watered sludge in this building.

Biosciences Laboratory

Art Meyers led the last portion of the tour in the Biosciences Laboratory, which is accredited through the National Environmental Laboratory Accreditation Program (NELAP). Bio-solids are captured and examined in the laboratory to ensure adequate biodegradation. The level of bioabsorption versus biodegradation varies by chemical. Mr. Meyers displayed a projection of the sludge at the microscopic level, explaining that the filamentous organisms may be an indication that additional ammonia is needed in the process. He also discussed EMIS, which Eastman uses to approve streams for entry into the WWTF. Streams that are not approved by him may be incinerated or treated in another manner. In the Aquatic Ecology portion of the Biosciences Laboratory, the tour group observed the fathead minnows used in biomonitoring.

The monitoring begins when the eggs are fertilized and testing is conducted once the larvae have hatched. Compliance tests are conducted to evaluate mortality and reproduction.

At 12:30 pm the tour group was escorted back to the administration building for lunch and presentations by Eastman personnel.

SUMMARY OF PRESENTATION AND DISCUSSION

Impacts of Mixture/Derived-from Rules on Eastman

Gerald Wrye began the presentation with a discussion of the impacts of the mixture and derived-from rules on Eastman. Eastman's primary concern is that the regulations focus too much on the history as opposed to the characteristics of the waste streams. Eastman currently manages waste under Subtitle C that would be managed as non-hazardous under Subtitle D if it were categorized based on its characteristics. Most of the waste streams of concern are F002, F004, or F005 listed wastes. There are a few U wastes, but no K wastes. The solvents are currently managed in the incinerator or the WWTF. Organic wastewaters from throughout the Eastman facility that cannot be managed in the WWTF are transferred to the incinerators. Greater than 50% of these wastewaters are hazardous wastes, but only about 0.5% are listed wastes. Because this small amount of listed waste is fed to the incinerators, the scrubber water is hazardous under the derived-from rule. Figures 2 and 3 show the hazardous waste inputs to both the WWTF and the hazardous waste incinerator.

The Kingsport facility has three RCRA incinerators. They are currently working on meeting the MACT standards for these incinerators and have completed the updates for two of them. Incinerator ash is managed on site in a hazardous waste landfill along with contaminated soils and refractory brick. A derived-from F039 waste is subsequently produced from the landfill. Groundwater monitoring wells in the vicinity of the landfill have had very small amounts of F039. Both the F039 waste and the scrubber water are sent to the WWTF; however, the total amount of F039 entering the WWTF is negligible.

Listed hazardous wastes (generally spent solvents) make up only 0.014% of the wastewater entering the WWTF. Under the mixture rule, the 25 to 29 million gal/day of wastewater exiting the WWTF are considered hazardous wastes.

Eastman has found phenolics to be the most difficult chemicals to treat using biodegradation. Sanitary wastewaters from the facility are sent to the City of Kingsport.

Biosludge from the WWTF makes up more than 75% of the non-wastewater hazardous waste on site and is a big concern for Eastman. The de-watered biosludge is sent to hazardous waste boilers. The ash produced by these boilers is Bevill-exempt and is disposed in an on-site Subtitle

D landfill. Mr. Wrye noted, however, that they are still required to conduct significant analyses to meet 40 CFR 266 Subpart H requirements. One problem for Eastman is waiting for the analytical results while accumulating large quantities of ash.

The following waste streams are generated as a result of the mixture/derived-from rules:

- 10.5 billion gallons/year wastewater
- 234 million lbs/year biosludge
- 63 million lbs/year boiler ash (Bevill-exempt)
- 3.9 million lbs/year incinerator ash
- small quantities of F039

The stream of most concern to Eastman is the biosludge. If the biosludge was exempted they would still burn it in boilers as a non-hazardous waste or use it as a feed to the gasification system. They would still be subject to MACT standards and air emissions regulations. The hazardous categorization for the biosludge prevents them from looking at beneficial uses. If the sludge were exempted, the small quantities of liquid hazardous wastes currently fed to the boilers would be directed elsewhere.

Mr. Wrye reiterated that the biosludge has very small amounts of hazardous waste from the original waste stream and Eastman would like it to be evaluated on its own characteristics. Some questions were asked about attempts by Eastman to do a mass balance around the WWTF. Eastman responded that the system is too complex and that the recycle and volatilization make the calculations difficult. Ron Josephson suggested that Eastman's efforts may have been overly complex. It was also suggested that if Eastman was able to do direct monitoring under the headworks rule, they might be able to get rid of the scrubber water. Ms. Evans noted that they would still report hazardous waste once a year so they could maintain their permit on the surface impoundments, which they don't want to close. Mr. Josephson asked whether Eastman had ever pursued a site-specific delisting. Ms. Evans remarked that they had spent a lot of time and effort with no luck, but they have accumulated a lot of data.

Removal of Chemicals in Wastewater Treatment

John Barber presented an overview of the wastewater treatment process and the removal of chemicals. His slides are included in this report as Appendix A. He began with a brief summary of the methods of treatment including biodegradation and hydrolysis and then discussed surface volatilization and sorption. The removal alternatives vary by groups of compounds. For instance, volatile organics can be treated using both biodegradation and volatilization, but heavy metals can only be treated using sorption. Mr. Barber further described the mechanisms involved in the sorption of heavy metals to biosludge.

Next he discussed the determinations that are used for the SARA report. Eastman uses analytical data, when available, including National Pollutant Discharge Elimination System (NPDES) monitoring reports, sludge analyses for the boilers, gas chromatography for the influent, Universal Treatment Standards (UTS) analyses for Land Disposal Restrictions (LDR) compliance on clarifier overflow, and additional special sampling. Data produced from a commercial modeling software, Toxchem, are also used. Eastman has a 15,000-gallon pilot plant next to the lab and had originally used an in-house modeling software. They found that samples using this model were lower than predicted and resulted in an overestimation of air emissions. Toxchem allows the user to build the treatment plant model and borrows chemical characteristics from Chem 9/Water 9.

Mr. Barber presented six charts outlining the data from Toxchem. These charts have been included as Appendix B. The summary chart for removal efficiency depicts the percent of a number of volatile organics that are lost to the air and to the sludge, and the percent that are removed during treatment. Two volatile organics charts depict the amount of several volatile organics in the influent and then in the sludge using total and TCLP analyses. A similar chart is included for several semi-volatile organics. Finally, the two metals charts depict the amount of several metals in the influent and then in the sludge using total and TCLP analyses.

Economics

The next presentation by Janet Evans described the economic consequences of a RCRA designation for Eastman's biosludge. Her presentation slides have been included as Appendix C. Management of the biosludge in tanker trucks invokes the RCRA container standards, and the inspection and recordkeeping requirements. The combustion of the biosludge is subject to extensive RCRA management requirements, recordkeeping, and permitting. Ms. Evans further described the uncertainties in the RCRA requirements for this 340-ton-per-day waste stream. The dewatering processes rely on the wastewater treatment tank exclusion. There are concerns with Bevill exclusions affecting the management of 31,000 tons of coal ash (> 50% coal must be maintained in boiler). Ms. Evans also stated that the hazardous designation limits Eastman's flexibility in considering other waste management options. For instance, significant amounts of the waste can't be shipped out for research because the research facility would also be required to have a permit.

Next, Ms. Evans addressed the annual operating costs associated with Eastman's RCRA boilers and incinerators. These costs include:

1.	Additional personnel	$500,000
2.	Additional low metals coal premium	$250,000-$500,000
3.	Low metals analysis	$150,000
4.	Bevill test costs (outside analyses)	$10,000
5.	Systems materials and maintenance	$5,000
6.	Continuous emission monitors materials and maintenance	$60,000
7.	In-house weekly and daily sludge analyses	$30,000
8.	Certification of Compliance Testing	$100,000
TOTAL ANNUAL COST		$1,105,000 - $1,355,000

Additional costs for permitting of RCRA BIF units and compliance with BIF MACT standards include:

1.	Risk assessment data collection	$500,000
2.	Trial burns	$700,000
3.	Establishing operating conditions and negotiating permit	$500,000
4.	Permitting fees	$150,000
5.	Installation of new APC equipment	$61,000
6.	Increased annual operating costs	$3,000,000

Eastman provided EPA and TDEC participants with two sets of data which have been included in Appendices D and E. The first is 2000 SARA Report wastewater treatment data. The second is data for the biosludge (without grit) spanning from July 1999 to January 2002.

Ms. Evans again addressed the delisting issue, indicating that Eastman had been told delisting wasn't applicable to thermal treatment. Clean fuel exemptions are not very useful since the limits are generally at the detection levels. There is the potential for an outlier data point with long term sampling which may make a facility out of compliance. Considering the large number of constituents, such low limits create problems with variability and certainty. She suggested a need for a rolling average or confidence level and stated that the exit levels proposed under HWIR in the past were too low. Efforts to obtain a delisting have been unsuccessful for Eastman. Ms. Evans added that the hazardous constituents in the biosludge come from characteristic wastes and not from the spent solvents.

Matt Hale and Mr. Josephson both agreed that it is harder to get out of the system than it is to get in. Barnes Johnson remarked that risk-based tools are usually available when establishing criteria, making this particular effort more difficult. Modeling with combustion also gets to be complicated. Mr. Hale pointed out that EPA is dealing with a wide range of potential situations which lead to conditions. EPA is held to a high-level analysis and has to justify why each condition makes sense. Using conditions on a national level will invite criticism for each assumption. Mr. Johnson noted that the options for risk based conditions have changed and that the 3MRA (Multimedia, Multipathway and Multireceptor Risk Assessment) model is no longer used. He added that constituency groups now want data for the person standing at the fence line of the facility. These proposed revisions require setting risk-based levels, which will be an area of substantial contention. EPA is already dealing with such contention for the Headworks rule.

Mr. Josephson briefly described the areas of interest to EPA in consideration of the proposed Headworks exemption. The first is obtaining data for the four solvents proposed by ACC. EPA is considering direct monitoring as a demonstration of compliance, but the reporting burden becomes a big issue with this alternative. Ms. Evans interjected that the reporting burden would be offset by the decrease in current recordkeeping requirements, which are overly extensive. Mr. Josephson noted that EPA is trying to evaluate what data are available for the risk analysis efforts and is considering where facilities should be conducting the monitoring. EPA does not want a one-size-fits-all model. In terms of the *de minimis* loss exemption, EPA is considering whether there are regulatory controls that can be used if F and K wastes are included.

Mr. Josephson also identified incinerator scrubber water and multi-source leachate as areas of interest. Ms. Burrell asked if the facility does any monitoring of their scrubber water. Ms. Evans responded that there is virtually no monitoring, other than checking the percent solids. When the scrubber water went to the city it was monitored, but it hasn't been since the late 1980s.

Etta Clark asked whether EPA would consider site-specific exclusions aside from delistings and, if so, how Eastman would explore this alternative. Mr. Hale noted that the route for a site-specific exclusion would be through the Region or state and not EPA Headquarters. He also suggested that such an effort would invoke priority and resource issues for EPA. The delisting process was specifically set up to address site-specific considerations. Nancy Dotson noted that the Eastman facility is very big with many processes and chemicals and indicated that it becomes difficult and complex to do a delisting.

Mr. Johnson remarked that there seemed to be two different stories being made. First, that if the waste is not considered hazardous, the boilers wouldn't have trial burns and there would be less burden in operating them. Secondly, if the waste is taken to the gasifier, then the boilers could be shut down, and the efficiency would be a lot greater. Ms. Dotson stated that they would still have MACT and air emissions standards to comply with under the first scenario. However, it wasn't clear what MACT standards would apply if the waste was non-hazardous. Mr. Johnson stated that EPA is looking at the net environmental impact and will continue to explore gasification.

The meeting was concluded at approximately 3:30 pm and Ms. Dotson remarked that she would work on getting invitations for EPA from other ACC members.

FIGURE 1

**WASTEWATER TREATMENT FACILITY
FLOW DIAGRAM**

FIGURE 2

WASTEWATER TREATMENT
YEARLY OUTPUT

FIGURE 3

WASTEWATER TREATMENT
HAZARDOUS WASTE FLOW

APPENDIX A

REMOVAL OF CHEMICAL COMPOUNDS IN WASTEWATER TREATMENT PLANTS

APPENDIX B

TOXCHEM DEMONSTRATION CHARTS

APPENDIX C

ECONOMIC CONSEQUENCES OF RCRA DESIGNATION

APPENDIX D

BIOSLUDGE DATA

APPENDIX E

SUMMARY OF WASTEWATER TREATMENT SARA COMPOUNDS

APPENDIX F

SITE VISIT PHOTO LOG